

ASCR™

Advanced Selective Catalytic Reduction Systems

*High performance NO_x reduction
at low capital cost*

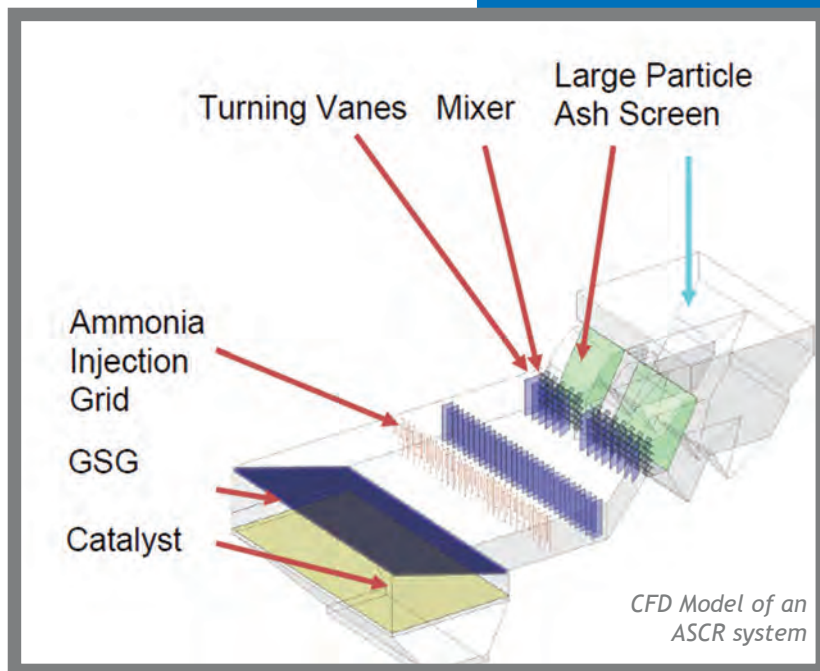
In today's Utility and Industrial Sectors, there are many drivers forcing boiler owners to reduce emissions from their power and steam generation facilities. Although regulatory targets may still be uncertain, it is certain that NO_x requirements are becoming more stringent. Owners must select NO_x control technologies that meet individual emission requirements while being cost effective.

Fuel Tech offers a wide range of NO_x reduction and emission control technologies that may be implemented as standalone processes or combined as needed to maximize NO_x reduction performance while limiting balance-of-plant impacts. This wide range of capabilities allows Fuel Tech to approach each application as a solutions provider rather than an equipment supplier.

Fuel Tech's ASCR™ Advanced SCR system combines proven technologies for cost-effective NO_x control from the point of combustion to the stack. These combined technologies may be applied as a retrofit solution for existing units or may be new generating units, capable of NO_x exceeding 80%.

The front end of the ASCR solution utilizes Fuel Tech's proven combustion systems include Low NO_x Burners (LNBs), burner modifications, and over-fire air (OFA) systems. These combustion solutions are built upon using our post combustion NO_x control products which include urea based Selective Non-Catalytic Reduction (SNCR) along with urea and ammonia based Selective Catalytic Reduction (SCR) systems.

The distinguishing features that set Fuel Tech's ASCR technology apart is our commercial experience and state-of-the-art design capabilities that allow us to understand the working relationships of the combined NO_x reduction technologies. These capabilities also allow us to evaluate each application and tailor a solution that maximizes the contribution of each technology in our suite of offerings without pushing any one process to the point that it impacts boiler operation or negatively impacts another NO_x reduction process downstream.



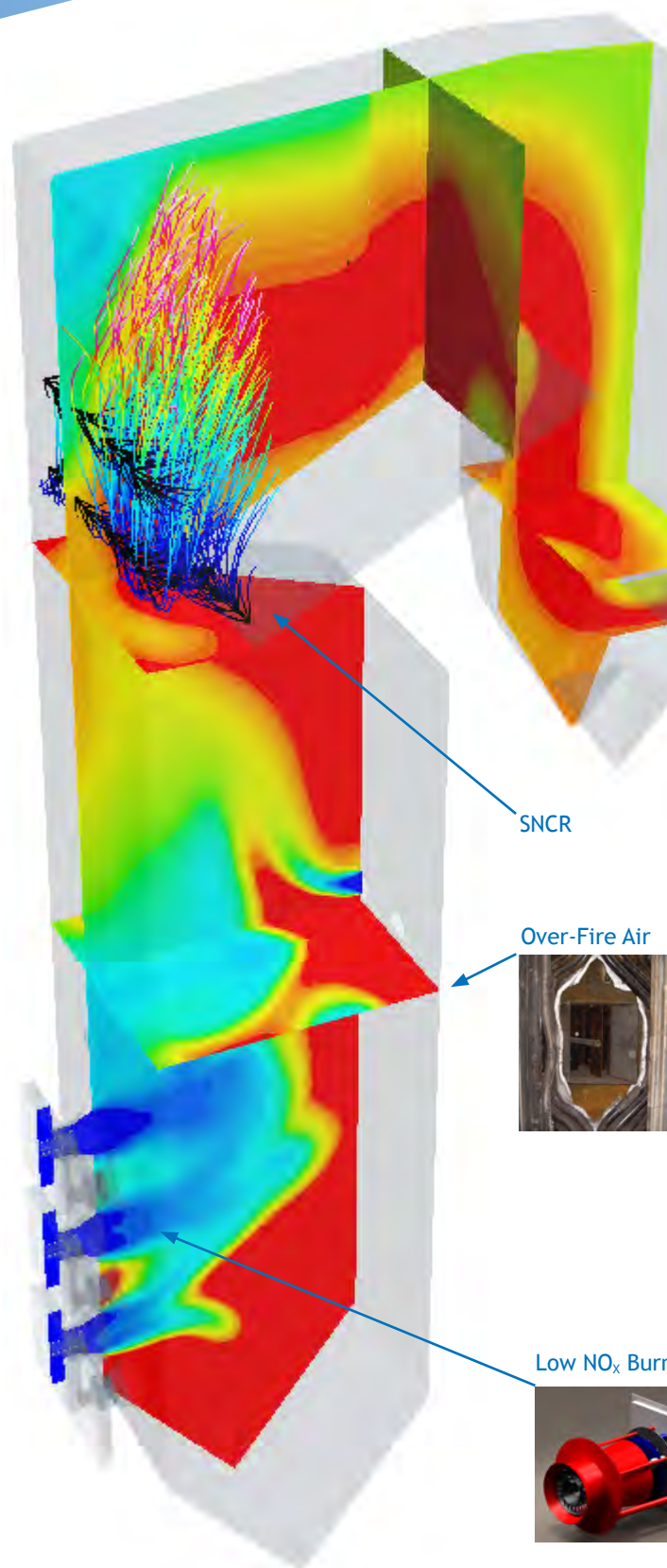
CFD Model of an
ASCR system

- 80+% NO_x Reduction
- Lower Capital and Operating Costs vs. Conventional SCR
- Minimizing SO₂ to SO₃ conversion rates
- ASCR combines commercially proven technologies
- Proven Mercury Oxidation of 90+%

The ASCR system offers significantly lower capital costs than traditional SCRs and provides the option of a staged capital investment.

SCR process design is the most critical step to successful SCR performance. Maximizing SCR performance and minimizing its impact on plant operations requires a thorough understanding of each application. For each project, Fuel Tech reviews potential fuels and fuel blends and the expected operating conditions and then utilizes its experience and design expertise to provide the best possible SCR design. Fuel Tech has many tools to provide the most efficient design for our ASCR systems. Our experimental model studies combined with Computational Fluid Dynamics (CFD) modeling provide insight into the flue gas parameters and flow conditions to develop the optimum duct configuration for the SCR. Fuel Tech works with industry leading catalyst suppliers to determine the appropriate catalyst type and formulation for any given application.

Corrective devices such as turning vanes, large particle ash (LPA) screens, static mixers, and the GSG™ Graduated Straightening Grid are the devices to implement an SCR that meets its performance goals. These important design steps help ensure trouble-free SCR operation and maximize catalyst life.



An ASCR™ system combines NO_x reduction technologies specific to your system - at 30-70% of the high capital cost of conventional SCR!

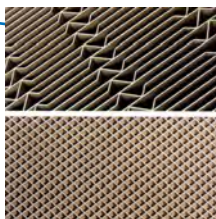
Static Mixer



GSG™
Graduated
Straightening Grid



Catalyst



AIG



The ammonia injection grid (AIG) is used to feed aqueous or anhydrous ammonia to the catalyst to ensure proper coverage to react with NO_x within the catalyst. Proper mixing of flue gas constituents and temperatures along with proper flow and velocity profiles to maximize NO_x reduction and to minimize ammonia slip emissions.

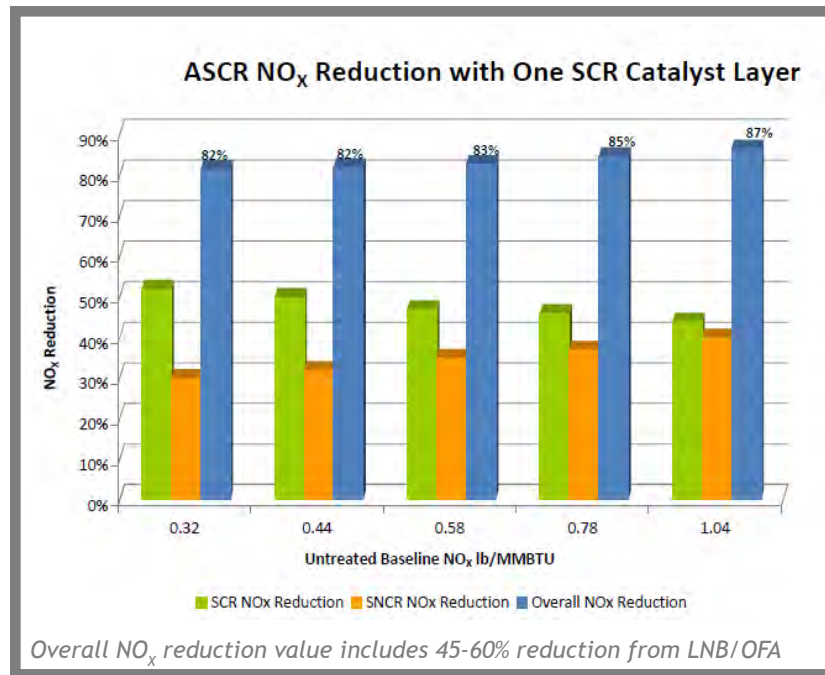
The ASCR technology incorporates a high performance SCR reactor where space permits. By utilizing an integrated technology approach, the catalyst quantity, weight, and space requirements can be minimized, potentially leading to the elimination of new foundations and the need to install new "steel to grade".

The scope of supply for Fuel Tech's ASCR systems include design, engineering, procurement, delivery, and startup of the following:

- Combustion modifications in the form of LNB, and OFA
- Urea based NO_xOUT® and HERT™ SNCR Systems
- Advanced SCR Systems and Components
- Modeling and Process Design with performance guarantees
- Static Mixer
- LPA Screen
- GSG™
- AIG
- ULTRA™ System – Urea Conversion for SCR Reagent Feed
- Catalyst specification and supply
- SCR Reactor design and supply
- System startup, optimization, and training services

Fuel Tech SCR Competencies:

- Experienced Process Design Capabilities with Performance Guarantees
- SCR Arrangement and Configurations
- Specification Development for Catalyst, Internals, Ductwork, and Sub-systems
- Supplier and Vendor Technical Bid Evaluations
- Project Oversight
- Performance Analysis and Optimization
- CATLife® SCR and Catalyst Management Services
- Single Source Responsibility



With the concept of a single layer of catalyst, the ASCR system has the added benefit of minimizing the rate of SO₂ to SO₃ conversion which is a precursor to ammonium sulfate/bisulfate formation in the air preheater. This low conversion rate allows for a broader unit operating range and fuel

flexibility. In addition, the reduced volume of catalyst demands less time for the replacement outage requirement and can typically be performed over a short outage. This single layer catalyst has been proven to oxidize 90+% mercury in the flue gas for capture with a Flue Gas Desulphurization (FGD) scrubber.

Fuel Tech's extensive experience base and financial status allow us to offer single source responsibility. System installation and installation management services are also available to meet customer needs. Our integrated systems may be applied to retrofit and new boiler applications, and our experience includes installation of more than 100 LNB and OFA systems, a combined 480 SNCR and SCR systems, SCR design and consulting support covering more than 50,000 MWs, and over 20,000 MWs of AIG Grid Tunings.

Fuel Tech's ASCR system is a combination of technologies that provide cost effective NO_x reduction and flexibility in meeting rapidly changing regulatory and public policy drivers. ASCR can be implemented in stages over time, providing financial advantages of both lower total installed capital costs and the ability to stage capital expenditures.



27601 Bella Vista Parkway | Warrenville, IL 60555

www.ftek.com | (US) 800.666.9688 • (China) 86.10.8487.1742 • (Italy) 39.0331.701110